



# Deactivation & Decommissioning/Facility Engineering Newsletter



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## In-Situ Decommissioning: Reducing Cost, Reducing Risk, and Sustaining the Environment

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### In-Situ Decommissioning



(ISD), the permanent entombment of highly radioactively contaminated facilities helps meet DOE sustainability goals while reducing demolition and waste disposal costs and human health and safety risks. ISD contributes to DOE's efforts to meet Executive Order 13514's sustainability goals through the reduction of greenhouse gas (GHG) emissions, petroleum consumption and waste generation.

EM faces the challenge of decommissioning thousands of excess nuclear facilities, each typically requiring complete deactivation, decommissioning, demolition and transport of radioactively contaminated debris. Often, the facilities are sturdy, hardened structures with enclosed contaminated equipment and process systems, including miles of pipeline and tons of volumetrically contaminated materials. One alternative to demolition and disposal is ISD.

Facilities most suitable for ISD are production reactors and the "canyons" Chemical Processing Facilities. Other buildings hav-

ing similar construction and contamination characteristics are also candidates for ISD. Using the Facilities Information Management System (FIMS), 84 facilities representing a footprint of about 1.8 million square feet were identified as potential ISD candidates.<sup>1</sup> Extending the FIMS criteria to facilities not yet transferred to EM expands the ISD candidate list to 125 - 200 facilities, complex-wide. DOE has ISD projects in various stages of planning and implementation at Hanford, Idaho National Laboratory (INL) and the Savannah River Site (SRS). Major projects include U-Canyon at Hanford; the Chemical Processing Plant -601/640 Fuel Reprocessing Facility at INL and the P and R-Reactor building complexes at the SRS.

GHG emission reductions through the application of ISD across DOE can be estimated based on projected construction-cost-avoidance (CCA). EM projects potential CCA as much as \$2.5-4 billion if ISD is implemented at the 125 - 200 potential ISD candidate facilities across the DOE complex. This reflects cost avoidance over the traditional approaches of demolishing and size-reducing the complete structure; then packaging and transporting the waste and debris to a dis-

(Continued on page 3)



## Hanford Site Clears Railroad Rails for Reuse

The Hanford Site has more than 100 miles of railroad track, and through the application of innovative approaches to characterization technology and contracting, more than 30 miles of track were removed for reuse offsite during the fall of 2010. During operations at the site, the railroad track was used for moving equipment and spent nuclear fuel between different site facilities. Much of this track is no longer needed to support site activities, and track removal is normally conducted as part of environmental restoration activities.

Because the rails were used for transporting radioactive materials from nuclear processing facilities, the rails could be contaminated. While the rails could be treated as waste and disposed of, they could also be reused if an offsite use could be identified and the residual radioactivity met the Department's rigorous requirements for "clearance" (i.e., radiological release) of property. Reuse is also in compliance with the Department's administrative restrictions on the recycle of metals from radiological areas. The DOE Richland Operations Office identified an offsite recipient for the reuse of the rails and initiated actions to determine if the rails could be cleared from radiological control.

The rails were cleared for reuse in accordance with the requirements in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." Washington Closure Hanford, the contractor responsible for leading this cleanup effort, prepared a radiological survey plan, based on the interagency "MARSAME" (Multi-Agency Radiation Survey and Assessment of Materials and Equipment) manual. After the radiological survey procedures were thoroughly reviewed and approved by the DOE Richland Office, the radiological survey was conducted in accordance with the specified survey plan.

The innovative characterization approach that was developed and used by Washington Closure Hanford for the radiological survey activities deserves special mention. A specially designed cart was placed on the rail tracks,



with radiation detectors located just above the rails. The cart was slowly moved down the track. This slow radiation scan was designed to identify any areas with elevated radioactivity, which might require a more detailed evaluation. Finally, after removal of the rails from the rail bed, more than 10% of the rails were randomly selected for a thorough confirmatory survey as a quality control measure.



"One of the challenges in clearance surveys is to determine the source of any elevated areas of radioactivity that might be detected," observed Wayne Glines, senior health physicist, DOE Richland Operations Office and lead DOE reviewer for the radiological survey plan. "The radioactivity levels used for the cart scanning were well below the Department's clearance levels. Consequently, some areas with concentrations of naturally occurring radioactivity along the track bed were pin-pointed and evaluated. Only one spot with elevated radioactivity from past Hanford operations was identified -- insects had constructed a nest on a rail with contaminated soil. The confirmatory survey activity did not identify any discrepancies, and this fact is a tribute to the effectiveness of the survey procedures."

An innovative contracting approach was also used for this project. A Washington Closure Hanford subcontractor removed the rails in lieu of a fee for the value of the rails removed. This resulted in a dramatically reduced cost to the government for the removal and disposition of these rails, in addition to the intrinsic value associated with reuse of the rails. "Reuse is an excellent alternative to burying it in a landfill. It doesn't make a lot of sense to take up valuable disposal space with material than can be reused. Reus-



*(Continued on page 3)*



## In-Situ Decommissioning: Reducing Cost, Reducing Risk, and Sustaining the Environment

(Continued from page 1)

posal facility. Applying the EPA published GHG emission intensity of 0.36 to 0.49 metric tons of CO<sub>2</sub> equivalents per thousand construction dollars spent for civil-engineering/heavy construction activities<sup>2</sup> to the projected CCA of \$2.5 to 4 billion results in potential GHG emission reductions of 900 thousand to 1.96 million metric tons of carbon dioxide equivalents.

ISD also substantially reduces the amount of waste generated over traditional D&D approaches. For the P and R - Reactor building complexes at SRS, ISD could avoid approximately 137,000 tons (5,400,000 cubic feet) of disposal debris. At the Waste Calcining facility at INL potential waste pretreatment/disposal savings by applying ISD could reduce from over 14,000 down to 750 cubic feet of waste. In short, the characteristics of ISD make it a vital element in the implementation of EM's Site Sustainability Plans as it moves forward with the effective deactivation and decommissioning of contaminated facilities from the cold war legacy.

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### Reference

1. DOE, 2009. DOE EM Strategy and Experience for In-Situ Decommissioning  
[http://www.em.doe.gov/EM20Pages/PDFs/ISD\\_Strategy\\_Sept\\_4\\_2009.pdf](http://www.em.doe.gov/EM20Pages/PDFs/ISD_Strategy_Sept_4_2009.pdf)
2. USEPA, 2009. Potential for Reducing Greenhouse Gas Emissions in the Construction Sector, Washington, D.C.



## Hanford Site Clears Railroad Rails for Reuse

(Continued from page 2)

ing the rail is environmentally friendly and represents a cost savings for DOE," said Brian Stubbs, Washington Closure project manager.

"This rail re-use project not only saved taxpayer dollars, but allowed us to move forward with removing 30 miles of track along Hanford's River Corridor," said Mark French, Federal Project Director for the River Corridor at the DOE Richland Operations Office. "Another benefit to putting these rails to use in other places is that we keep from using up valuable space at our on-site disposal facility. We continue to make progress in cleaning up the River Corridor in order to meet our footprint reduction goals."

Andrew Szilagyi, Director of the DOE Headquarters Office of D&D and Facility Engineering, also voiced support, "The project helps the Department meet important goals for the recycle and reuse of resources. Further, compliance with the Department's stringent radiation protection requirements is thoroughly demonstrated. In addition, Washington Closure Hanford demonstrated an innovative technical approach in the radiological survey. This radiological approach may well be applicable by other contractor organizations at other sites. The contracting approach is also innovative. So this project is a success on many levels."

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## The Experimental Breeder Reactor II D&D Project in Idaho

The Experimental Breeder Reactor-II (EBR-II) at the Idaho National Laboratory began operations in the 1960s providing important fast breeder reactor technology using an innovative sodium-cooled approach, which



efficiently removed heat during reactor operations. Today, the same sodium coolant, which allowed the safe and efficient operation of the reactor, poses significant and unique safety and operational challenges to the Idaho Cleanup Deactivation & Decommissioning (D&D) Project due to its nature of reacting violently with air or water.

Nine buildings will need to be deactivated in order for the D&D activities to meet the project's end-state of removing the existing EBR-II structures. Included in the project scope are the mechanical and electrical isolation of EBR-II buildings from the balance of the Materials and Fuels Complex (MFC) buildings; the rerouting of active utility (steam, water and electric-

ity) systems and the removal and treatment of hazardous materials, such as, lead, asbestos, sodium and sodium-potassium (NaK) alloys.



Installation of band heaters on the 16,000 gallon sodium storage tank

The EBR-II D&D Project's major challenge is accomplishing the sodium and

NaK treatment milestones on time. Previously, the EBR-II Project Team attempted removing sodium and NaK fouled components using superheated steam and then by deploying a wet carbon dioxide (CO<sub>2</sub>) process. While both the superheated steam and CO<sub>2</sub> processes worked well with small quantities of sodium, an optimum process needed to be developed to remove EBR-II system sodium and NaK deposits on a much larger scale. Therefore, the EBR-II Project Team investigated non-standard engineering solutions for treatment and disposal of sodium and NaK.

With funding support from the Office of Deactivation and Decommissioning and Facility Engineering, the

EBR-II Project Team developed a citric acid solution that reacts calmly with sodium, neutralizing the treatment residue within the existing systems to be deactivated. This new chemical process was developed in collaboration with CWI (CH<sub>2</sub>M Hill and Washington Group International), University of Idaho Extension Office; Creative Engineering, Incorporated; Premier Technologies, Incorporated and Communication Designs, Incorporated. Successful application of the chemical process allows sodium and NaK systems to be removed safely and efficiently, thereby reducing

overall project cost and reducing D&D worker exposure to hazardous materials.

It is estimated that this new technique will save millions of dollars while reducing the schedule by an estimated four years over the original plan, which called for removing piping and equipment in small sections and treating each separately. A provisional

U.S. patent application has been filed on the unique citric acid technique because it may be applicable in select locations globally.



Crews work to perform the first phase of sodium treatment in the control room (center at the base of the dome) and in the air scrubber unit (left of the control room).

In February 2011, the first round of treating the passivated sodium with citric acid and cleaning out piping was successfully completed. During the next phase continuous 12-hour shifts for two to three months are tentatively scheduled to start to process the sodium in MFC-767 (the silver-domed reactor building) and MFC-766 (the sodium cooler building). This phase includes removing sodium-filled components from the secondary system for treatment in the primary tank, which continues to be prepared for the final treatment process.

*(Continued on page 5)*

## The Experimental Breeder Reactor II D&D Project in Idaho



Installation of instrumentation to monitor the sodium treatment process

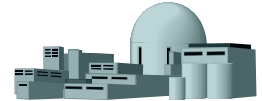
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After the sodium and associated pipes, tanks, and other components are removed, workers will demolish the 58,439 square foot reactor and associated structure. The project is

scheduled for completion in June 2012, an estimated four years ahead of schedule and \$6 million below the original budget.

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## EM Hosts the 11<sup>th</sup> Annual Nuclear Energy Agency's International Working Party on Decommissioning and Dismantlement

The Office of Deactivation and Decommissioning and Facility Engineering (D&D/FE) sponsored the 11<sup>th</sup> annual conference of the Organization for Economic Cooperation & Development/Nuclear Energy Agency (OECD/NEA) Working Party on Decommissioning and Dismantlement (WPDD). The WPDD Conference was held at the Department of Energy (DOE) Headquarters in Washington, DC from November 15-18, 2010. The conference included a visit to the Savannah River Site on November 19 where attendees toured C Reactor and 235F Plutonium Fuel Form Facilities observing DOE D&D operations first hand.

The NEA, whose mission is to assist member countries in developing safe and sustainable strategies for the management of radioactive materials, is comprised of 28 nations from North America, Europe and Asia. The NEA places emphasis on the management of long-lived waste, spent fuel, and the decommissioning of nuclear facilities. Other U.S. Federal Government Agencies participating in the WPDD Conference included the U.S. Nuclear Regulatory Agency (NRC) and the U.S. Environmental Protection Agency (EPA), as well as the Electric Power Research Institute (EPRI) and commercial industry representatives from Sargent & Lundy and US Ecology.

The overall focus of the WPDD Conference was to define the aspects of nuclear facility decommissioning that have the greatest potential for future technology development and improvements through international

collaborations. Technologies presented to the group included the D&D/FE sponsored Remote Stack Characterization System, the Swiss approach to the treatment of metal and organic waste, and the NRC's 3-D Modeling of Soils & Groundwater processes.

Prior to the start of the November 2010 Conference, the WPDD investigated the challenges of applying innovation technologies for decommissioning facilities and components, remediating soils and limiting the spread of contamination in groundwater. Representatives from Belgium, France, Italy, Japan, Switzerland, Spain, Canada, the United Kingdom and the United States (DOE, NRC and EPA) reviewed the data obtained from looking at five major "themes" and the R&D needs associated with each theme.

- Characterization prior to dismantling
- Segmentation and dismantling
- Decontamination and environmental remediation
- Materials and waste management
- Site characterization and environmental monitoring

It was agreed that a report will be prepared that identifies the most significant needs for R&D in each of the five thematic areas.

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## FY2011 FIMS Data Validation Process

The Facilities Information Management System (FIMS) is the Department's corporate database for real property as required by DOE Order 430.1B **"Real Property Asset Management."** The system provides the Department with an inventory and management tool that assists with planning and managing all real property assets. Complete and accurate information on real property holdings is critical to the Department for managing facilities and reporting to the General Services Administration (GSA), Office of Management and Budget (OMB), Congress, and the taxpayers. Each year, by the end of November, site FIMS administrators enter updated data into FIMS. The data is validated between January and June of the following year. In FY2011, EM validated data at seven sites with successful results: Moab, Waste Isolation Pilot Plant (WIPP), Savannah River Site (SRS), Hanford, East Tennessee Technology Park (ETTP), Portsmouth, and Paducah. The Office of Deactivation and Decommissioning and Facility Engineering conducted the validations

between February and June. The Office of Engineering and Construction Management (OECM) attended two of the seven sites: WIPP and ETTP. The validation results are shown below.

SITE	SCHEDULE	SCORE-CARDS	TEAM NOTE
Portsmouth	Week of February 21, 2011	Green	EMCBC Led
MOAB	Week of February 28, 2011	Green	EMCBC Led
Paducah	Week of March 7, 2011	Green	EMCBC Led
Savannah River	Week of March 21, 2011 (Validation was coupled with a maintenance program review.)	Green	
Waste Isolation Pilot Plant	June 1-2, 2011	Green	(with OECM)
Hanford	June 20-22, 2011	Green	
ETTP	May 25-26, 2011	Green	(with OECM)

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## DOE E-Star Awards – Environmental Management's Achievements in Pollution Prevention and Sustainability Stewardship

The DOE Environmental Sustainability (E-Star) Award recognizes innovation and/or excellence in pollution prevention and environmental sustainability stewardship efforts within the Department with selections made by an independent panel. The E-Star Awards are open to all environmental projects and practices performed by DOE employees, sites, facilities, programs, and contractors.

The protection of streams and rivers from the toxic effects of outfall discharges is a significant national priority with traditional treatment systems being based on

standard water treatment techniques to remove toxic contaminants. In FY 2010, the Savannah River Site (SRS) won a DOE Honorable Mention Award for its development and implementation of its innovative project entitled, "Detoxification of Outfall Water Using Natural Organic Matter". The SRS project team developed an innovative, "green" water treatment technology which removed toxic contaminants while reducing environmental impacts, improving stream water quality, minimizing land disturbance, providing waste and pollutant avoidance, all with minimal energy demands. The cost avoidance from this project is estimated at over \$10 million for the life of the project. For 2011, there were 186 nominations with only fifteen E-Star Awards and three E-Star Honorable Mentions of which EM was awarded three E-Star Awards. The Savannah River Site was the recipient of two 2011 E-Star Awards, one for its "Renewable Energy Technology Deployment, and Education in South Carolina - A Collaboration Between Savannah River National Laboratory & Economic Development Partnership of South Carolina" and the other for the "Savannah River Site Tritiated

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SRS Water Detoxification Unit



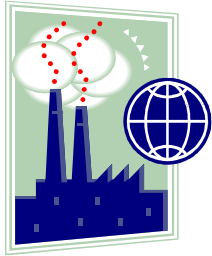
**EM Environmental Management**

safety ♦ performance ♦ cleanup ♦ closure

[HTTP://WWW.EM.DOE.GOV/EM20PAGES/DDFE.ASPX](http://www.em.doe.gov/EM20PAGES/DDFE.ASPX)



## Reducing Greenhouse Gas: Part of Federal Leadership in Environmental, Energy and Economic Performance



DOE submitted its FY 2010 greenhouse gas (GHG) comprehensive inventory and FY 2008 GHG baseline inventory to DOE's Federal Energy Management Program (FEMP), reporting important decreases in GHG emissions. Executive Order (E.O.) 13514, *Federal Leadership*

*in Environmental, Energy, and Economic Performance*, signed on October 5, 2009 requires all federal agencies to establish and report to the Council on Environmental Quality and Office of Management Budget a comprehensive inventory of GHG emissions across all three scopes for fiscal year 2010. Comprehensive inventories shall be submitted annually thereafter at the end of each January. DOE is working to achieve a 28% reduction in Scope 1 and Scope 2 GHG emissions and 13% reduction in Scope 3 emissions.



**Scope 1** -includes greenhouse gas emissions from sources that are owned or controlled by a Federal agency.

**Scope 2** -includes greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by a Federal agency.

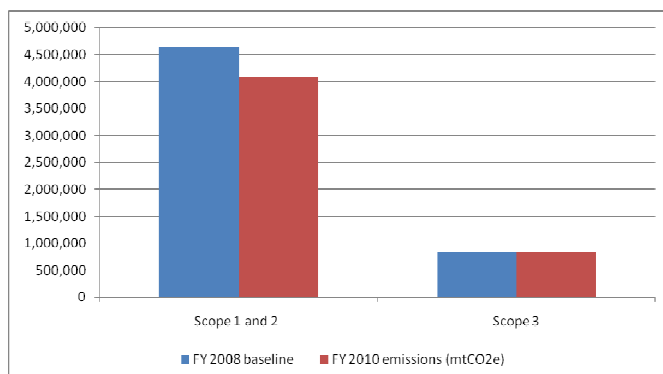
**Scope 3** -includes greenhouse gas emissions from sources not owned or directly controlled by a Federal agency but related to agency activities, such as business travel and employee commuting.

The Office of Environmental Management GHG emissions also decreased for Scope 1 and 2 and increased for Scope 3 from the 2008 baseline as follows:

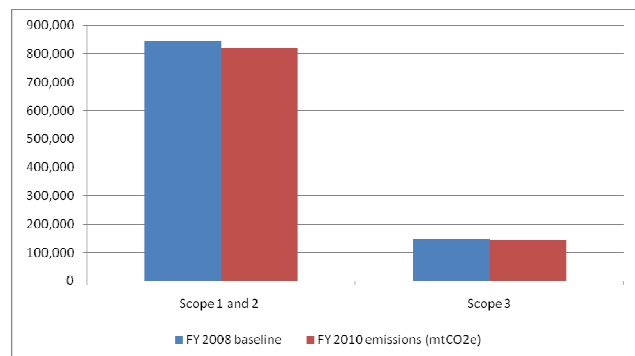
Scope	FY 2008 Baseline (mtCO <sub>2</sub> e)	FY 2010 Emissions (mtCO <sub>2</sub> e)	Percent Change	Goal % (by FY 2020)
1 and 2	841,842	821,879	-2.4	-28
3	145,658	147,786	+1.5	-13

The table below shows DOE's emission inventories.

Scope	FY 2008 Baseline (mtCO <sub>2</sub> e)	FY 2010 Emissions (mtCO <sub>2</sub> e)	Percent Change	Goal % (by FY 2020)
1 and 2	4,641,598	4,088,605	-11.9	-28
3	843,973	839,893	-0.5	-13



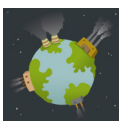
The reported decreases in GHG are an important step towards achieving DOE's goals for sustainable opera-



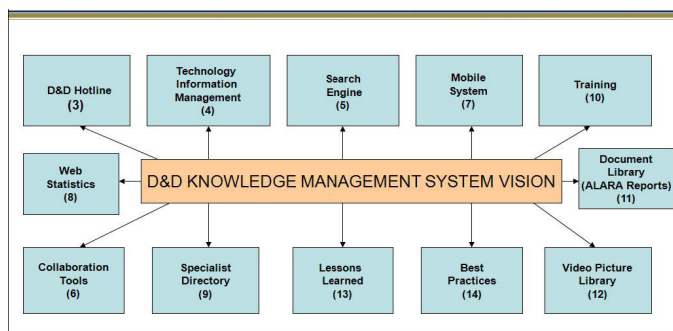
tions and EM will continue its efforts to making as large a contribution as possible.

**EM Path Forward** — EM Headquarters and Field Offices are establishing site sustainability goals and action milestones to cost-effectively meet those goals.

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## Knowledge Management— A D&D Community of Practice Information Resource



The Deactivation and Decommissioning Knowledge Management Information Tool (D&D KM-IT) debuted at the Waste Management 2011 Conference in Phoenix, Arizona in February 2011. The system was developed by Florida International University-Applied Research Center, in collaboration with the Office of Deactivation and Decommissioning and Facility Engineering, the Energy Facility Contractors Group, and the ALARA Centers at Hanford and Savannah River. A web-based knowledge platform developed for the D&D community the D&D KM-IT provides a knowledge tool focused on providing a single-point access into the “collective knowledge base” of the D&D community, within and outside of DOE. The D&D KM-IT brings the D&D “community of practice” together in a common forum to share their “know-how,” their real-world experiences, their best practices and lessons learned, with their references, readings, writings, and their other sources for “solutions.”

Built in a “modular” approach, the D&D KM-IT features the following active modules:

Hotline, Technology, Lessons Learned, Best Practices, ALARA Reports, Specialist Directory and Video/Picture Library. Four modules remain to be added: the Mobile System, Vendors, Training, and Collaboration Tools.

The D&D KM-IT can be accessed on the web at:

<http://dndkm.org>

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## Maintenance Program Reviews ~ Update ~



Environmental Management’s Maintenance Program Reviews were jointly conducted by Headquarters and Field Office staffs at the Hanford Site in late August 2010, the Waste Isolation Pilot Plant (WIPP) in late October 2010 and the Savannah River Site (SRS) in late March 2011. The review teams verified that the maintenance programs meet expectations in DOE Order 430.1B (Real Property Asset Management) to promote safety, health, and environmental protection; and meet program missions. The teams identified opportunities to enhance elements of the maintenance programs including developing multi-year maintenance plans. In addition, the teams noted that DOE corporate metrics do not consistently reflect site conditions thus EM faces challenges in maintaining beyond design-life assets and safeguarding excess facilities within constrained budgets.

EM issued the Hanford review report in March and is completing reports for the WIPP and SRS reviews. The reviews for the remaining EM sites will be scheduled as needed after the WIPP and SRS reports have been issued.



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## DOE E-Star Awards – Environmental Management’s Achievements in Pollution Prevention and Sustainability Stewardship

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Debris Remediation Project." The third EM 2011 E-Star Award went to the East Tennessee Technology Park for its "Sustainability in On-Site Shipping" project.

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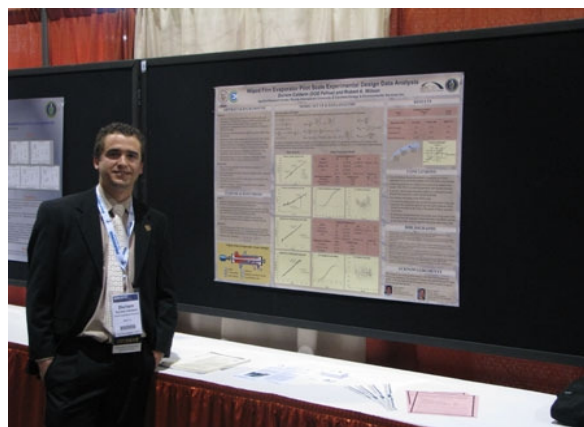


## DOE Fellow on His Way to DOE's Hanford Site - Via Habana, Miami, the DOE Fellows Program, and Lots of Hard Work

**D**uriem Calderin graduated with a Bachelor's degree in Nuclear Engineering in 2006 while attending a college and living in Havana, Cuba, after which he started work as a junior physicist at the Cardiovascular Institute of Cuba. On July 27, 2007, Duriem began a new life and journey towards a new career after coming to the United States.

In 2008, Duriem entered the Biomedical Engineering Program at Florida International University (FIU) as a graduate student and in October of the same year, he applied and was selected to participate in the FIU-Applied Research Center (ARC) DOE-FIU Science and Technology Workforce Development Program (a workforce development program established by U.S. Department of Energy (DOE) and FIU-ARC designed to create a "pipeline" of minority engineers specifically trained and mentored to enter the DOE workforce in technical areas of need). The DOE Fellows Program gave him the opportunity to participate in DOE-Environmental Management's applied research projects with a focus in the field of Health Physics where his main task entailed the demonstration and evaluation of an innovative technology developed by DOE's Y-12 Security Complex in Oak Ridge, TN. Under the guidance and supervision of the DOE Fellows Program Director, he conducted technology evaluations using ARC's Radiological Laboratory where uranium oxide and Technetium – 99m (Tc99m) used for the evaluation of the DOE developed innovative technology called "SIMWYPES®." In addition, the research he performed while working on this DOE-EM funded project constituted the basis for his Master's thesis at FIU. The DOE Fellows Program also gave him the opportunity in 2009 to participate in a summer internship at Columbia Energy & Environmental Services (a DOE contractor) in Richland, WA. The objectives of his research was to understand the thermodynamic and the heat transfer processes of the "Wiped Film Evaporator" (a system that operates at high vacuum pressure with the goal of reducing the amount of water within the wastes matrix); to analyze the data recorded from previous tests and establish the range of operation from the principal factors that

affect the process; and to design the experimental procedure and select a statistical model to acquire and process the data. His analysis and outstanding performance while at Columbia Energy during his summer internship earned him recognition, not only by his direct supervisor but also by the president of the company. Further, he presented his research at the Health Physics Society's meeting in 2010 and later submitted for presentation at the 2011 Waste Management Conference in Phoenix, Arizona.



Duriem presenting his research.

As a DOE Fellow, he became a member of the American Nuclear Society, the Society of Hispanic Professional Engineers, the Health Physics Society, and the Ronald E. McNair Post Baccalaureate Achievement Program. Duriem successfully graduated in the summer of 2010 with a Master of Science in Biomedical Engineering. Upon his graduation, Columbia Energy Environmental Services hired Duriem where he will be supporting the environmental remediation efforts at DOE's Hanford Site.

Duriem's exposure to DOE-EM's environmental remediation challenges during his tenure as a DOE Fellow has provided him with a strong technical knowledge base but has also given him the necessary tools to start a promising career in the field of environmental remediation.

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## U.S. DEPARTMENT OF ENERGY



D&D/FE IS ON THE WEB AT - [HTTP://WWW.EM.DOE.GOV/EM20PAGES/DDFE.ASPX](http://www.em.doe.gov/EM20PAGES/DDFE.ASPX)

### Office of Deactivation and Decommissioning and Facility Engineering (D&D/FE)

**Andrew Szilagyi, Director**

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## Technical Assistance: The Staff Knowledge Directory

The D&D/FE staff members represent a knowledge-base available to help assist projects in identifying solutions through technical assistance across a wide-range of Deactivation and Decommissioning (D&D) and Facility Engineering (FE) topics. The following listing is a sampling of knowledge areas and contact information.

<b>James Antizzo</b> – <a href="mailto:james.antizzo@em.doe.gov">james.antizzo@em.doe.gov</a> [301-903-7182]	D&D — Geology: environmental sciences, environmental regulations, energy parks initiative
<b>Lee Brady</b> – <a href="mailto:lee.brady@em.doe.gov">lee.brady@em.doe.gov</a> [301-903-4543]	D&D — Mechanical Engineering: D&D Support
<b>George Cava (P.E.)</b> – <a href="mailto:george.cava@hq.doe.gov">george.cava@hq.doe.gov</a> [301-903-7641]	D&D — Mechanical Engineering: Ocean Engineering; program & project management, D&D guidance & planning, External Technical Reviews (ETRs)
<b>Ker-Chi Chang (PhD, P.E.)</b> – <a href="mailto:ker-chi.chang@em.doe.gov">ker-chi.chang@em.doe.gov</a> [301-903-1383]	FE — Civil/Hydraulic/Environmental Engineering: Environmental, Energy, and Transportation Program; facility and infrastructure
<b>John De Gregory</b> – <a href="mailto:john.degregory@em.doe.gov">john.degregory@em.doe.gov</a> [202-586-5842]	FE — Electrical Engineering: knowledge management; information research & management; robotics and remote systems; communications
<b>Albes Gaona</b> – <a href="mailto:albes.gaona@em.doe.gov">albes.gaona@em.doe.gov</a> [202-586-0932]	FE — Environmental Science: Facilities Information Management, facilities and infrastructure, sustainability
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<b>Paula Kirk (IPA)</b> – <a href="mailto:paula.kirk@em.doe.gov">paula.kirk@em.doe.gov</a> [202-586-5426]	D&D — Biochemistry: strategic planning, environmental engineering, environmental sciences, project management
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